

can be seen that each tubing **12**, **14** is wound as a spiral, where the resulting coil becomes taller in the vertical direction while the face of the plate **5** remains horizontal as the plate **5** moves downward, as best seen in FIG. **3**. As also depicted in the perspective view of FIG. **5**, the inlet tubing **14** is formed as a coil and has a number of inlet rings. Similarly, the outlet tubing **12** is also formed as a coil and has a number of outlet rings. The two coils are arranged “within” each other such that the inlet and outlet rings are interleaved, or the inlet and outlet rings together form an alternating sequence, as best seen in FIG. **2** and in FIG. **3**. The entireties of the inlet and outlet tubing **14**, **12** are positioned inside the chamber body **1** (once the lid **4** has been fitted to close off the open top of the chamber). This may be done by lowering the lid assembly **9**—see FIG. **2**—into the chamber body **1**, where the lid assembly **9** in this example also includes the plate **5** as attached to the lower ends (inlet and outlet) of the tubing **12**, **14**. Also, in the particular embodiment depicted in FIG. **3**, note how the inlet and outlet rings conform to the inner surface of the sidewall **2**, which in this case is cylindrical such that the rings are circular and are positioned adjacent to the sidewall **2**. The rings may even touch the inside surface sidewall **2** along their outer perimeters, although there should be a small enough gap between the rings and the sidewall **22** that allows the coils to expand freely (lengthwise) as the plate **5** moves downward due to force of gravity alone (assuming the plate **5** is heavy enough to overcome the sum of the spring forces of the two, coiled tubings **14**, **12**).

[0025] The embodiment depicted in FIG. **2** and in FIG. **3** may also be described as having inlet tubing **14** and outlet tubing **12** that are inside the chamber body **1** and that are wound as spirals, respectively. Both of the tubings **14**, **12** simultaneously become taller, in the vertical direction, as the plate **5**, while remaining in a horizontal or flat orientation, moves downward. Both tubings **14**, **12** become shorter simultaneously, in the vertical direction, when the plate is pushed upward. In this regard, FIG. **2** shows the plate **5** in its full upward position where the coils are compressed to such an extent that there is essentially no gap between adjacent inlet and outlet rings. This fully compressed state of the coils may not be the “natural” state of the lid assembly **9** if it were fitted to the chamber body **1** as in FIG. **3**. FIG. **2** should be understood as depicting the situation where the plate **5** is resting on a surface and the lid **4** is heavy enough and is free to move downward as far as needed until the tubing **12**, **14** has become fully compressed as shown.

[0026] Referring now to FIG. **3**, as seen in this section view, an outlet hole **12** is formed in the lid **4** through which vapor (produced by the sublimation/vaporization of the substance in the chamber) may be drawn out of the chamber. If the substance has high enough vapor pressure, then the vapor out flow may be direct or self-propelled, and may be controlled through an orifice device (not shown, but in most instances located outside of the chamber body **1**, along with associated plumbing). In that case, there may be no need for pumping a carrier gas into the chamber, to transport the vapor through the external plumbing. If, however, the substance does not have a high enough vapor pressure to enable its vapor to self propel directly through the external plumbing, then as seen in FIG. **3**, a carrier gas passage **16** may be provided through which a carrier gas may be pumped into the chamber. An inlet/outlet control valve cluster as shown in FIG. **2** may serve to control inlet flow of the carrier gas

and outlet flow of the vapor-carrier gas mixture. The carrier gas mixes with vapor in the chamber, and the mixture may be drawn out of the chamber body **1**, e.g., through the outlet hole **12** in the lid **4**. The carrier gas may be an inert gas such as argon, nitrogen, helium or other inert gas that is non-reactive relative to the substance.

[0027] In one embodiment, the carrier gas passage **16** is composed of a telescopic tube that extends from the bottom **3** of the chamber body **1** upward to the bottom face of the plate **5**, as shown. The bottom end of the telescopic tube communicates with a hole in the bottom **3** of the chamber body **1**, which is an inlet port for the carrier gas. As the plate **5** descends (due to the substance being consumed), the carrier gas passage **16** shortens, for example as a telescopic tube would, while allowing the carrier gas to flow unimpeded and to mix with the vapor that is being produced at the top surface of the substance between the substance and the bottom face of the plate **5** (while bypassing contact with the substance below.)

[0028] Note here that the heat produced by the carrier jacket **8**, and the fact that the carrier gas passage **16** (e.g., a telescopic tube) is surrounded by the substance which is being heated, in effect helps preheat the carrier gas before the carrier gas mixes with the vapor. This may improve consistency of saturation of the vapor (within the carrier gas). This allows for efficient transport of the vapor out of the chamber (through the outlet hole **12**) as the mixture of the vapor and the carrier gas fills the space in the chamber above the plate **5** and is drawn out through the outlet hole **12**.

[0029] In some embodiments, a guide **15** may be added to help locate the plate **5**, as it descends down. A hole may be formed in the plate **5** through which the guide **15** extends. In the embodiment of FIG. **3**, this hole is formed in the center region of the plate **5** and may be aligned directly above the hole that is formed in the bottom of the chamber body **1**, which acts as an inlet for the carrier gas (and that is communicating with the bottom end of the carrier gas passage **16**). The guide **15**, however, may be located elsewhere, and there may be more than one guide **15** to for example help keep the plate **5** level (as it descends within the chamber). The guide **15** may also be a telescopic structure that extends from the top of the plate **5** to the maximum height of the plate **5**, when the greatest amount of the substance is present in the chamber, and may have a larger diameter than that of the carrier gas passage **16**.

[0030] In one embodiment, one or more grooves may be formed in the bottom face of the plate **5** that extend outward, e.g., from the center region of the plate **5** to an outermost region of the plate **5**. This provides increased surface area for the vapor, which may assist in improved mixing of the vapor and the carrier gas below the plate **5**, as the flow of the mixture is guided along a sufficient groove length (or a number of distinct grooves) that may enable the carrier gas to be more fully saturated with the vapor by the time it reaches the outermost edge of the plate **5** and then seeps up and across the plate **5** (to fill the space above the plate **5** inside the chamber). The saturated carrier gas may then be drawn out through the outlet hole **12**—see FIG. **3**.

[0031] As an example, referring now to FIG. **4**, a curved groove **18** may be formed that spirals outward as shown, from the center region of the plate **5** to an outermost edge region of the plate **5**. Other, non-curved patterns are possible